International Development Research Centre

Centre de recherches pour le développement international

TRAINING STUDY

COLOMBIAN CASE

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TRAINING STUDY

COLOMBIAN CASE

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INTRODUCTION

The training policy study on Colombia includes the following sections:

I. National Overview

II. Institutional Case Studies

III. Summary and Recommendations

I. National Overview Methodology

The information for this section was obtained from studies made by Colciencias, the agency in charge of defining policies, promoting and coordinating scientific and technological activities in Colombia. These studies are:

1. Colciencias. El Sistema Científico y Tecnológico de Colombia. Preliminary version. Bogotá, 1980.

2. Colciencias. Inventario Nacional de Recursos Humanos, Financieros e Institucionales del Sistema Científico y Tecnológico de Colombia. Preliminary information. Unpublished.

3. Colciencias. DNP-1-640-UDS. Plan de Integración Nacional-Política de Ciencia y Tecnología. Bogotá, February 8, 1980.

4. Ahumada, Jorge. Plan de Impulso a la Investigación en la Universidad Colombiana. Bases para un Programa Nacional de Formación y Perfeccionamiento de Docentes-Investigadores. Preliminary version. Colciencias Bogotá, July, 1978.

5. Colciencias. La Investigación en la Universidad Colombiana. Bogotá, 1978.

6. Monografía de Colombia. Presented at the United Nations Conference of Science and Technology for Development.

In addition to the bibliographic study, the following members of Colciencias staff were interviewed:

- Dr. Efrain Otero, Director
- Dr. Jorge Ahumada, Projects Director
- Dr. German Mesa, Head of the "National Inventory in Science and Technology" (second census), 1978.

It must be stressed that their judgement is based upon their knowledge of the research work carried out by Colciencias for the creation and development of a national research system.

II. Institutional Case Studies Methodology

Three institutions from different fields of activity were chosen for this study: The Instituto Colombiano Agropecuario, ICA (The Colombian Institute for Agriculture), la Fundación para la Educación Superior y el Desarrollo, FEDESARROLLO (The Foundation for Higher Education and Development), and the Health Division at Valle University.

The criteria for selecting these institutions were:

a. Each of them is outstanding in its own field: ICA in agricultural research, Valle University in health research, and FEDESARROLLO in the social science research.

b. IDRC has sponsored research projects with a training component in the first two above-mentioned institutions.

Moreover, the specific details about the methodology used for each institution is given before the interview.

NATIONAL OVERVIEW

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NATIONAL OVERVIEW

I. The Nature of Scientific Capacity

The scientific capacity of the country can be measured by the following indicators: the number of agencies dedicated to research, the funds allocated to research, the number of researchers, and the number of research projects.

Based on the study carried out by Colciencias* in relation to the scientific and technological system in Colombia 1/ and the preliminary results of a national inventory on human, financial and institutional resources, made by Colciencias in 1978 2/, the following description is presented.

1. Institutional Resources

Chart No. 1 shows the distribution of the agencies which carry out scientific and technological activities, according to Colciencias National Inventory of 1978. This inventory distributes them in the following sectors: "government", "university", "research institutions", "scientific and technological services", and "productive sector".

Out of a total of 128 agencies involved in science and technology, 93 conduct research. Only the so called "research institutions" have research as their main activity. Universities give priority to teaching. These two sectors stand out numerically in doing research. Following them, in order of importance are: scientific and technological services, government, and the productive sector.

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* Colciencias - Fondo Colombiano de Investigaciones Científicas y Proyectos Especiales "Francisco José de Caldas" (Colombian Fund for Scientific Research and Special Projects "Francisco José de Caldas"). (See Annex I).

1/ Colciencias. El Sistema Científico y Tecnológico de Colombia. Preliminary Version, Bogotá, 1980.

2/ Colciencias, Inventario Nacional de Recursos Humanos, Financieros e Institucionales. (Segundo Censo). Preliminary Data, 1978, Bogotá.

CHART No. 1

Science and Technology Agencies, by Sectors (1978)

Sector *	Scientific and technological activities**		Agencies Performing Research	
	No.	%	No.	%
Government	28	21.9	15	16.1
University	40	31.3	33	35.5
Research Institutions	23	18.0	23	24.7
Scientific and Technological Services	26	20.3	19	20.4
Productive Sector	11	8.6	3	3.2
TOTAL	128	100.0	93	100.0

* Definition of Sectors:

Government Sector: Includes all agencies which depend on the central government budget, either national, regional or local. Does not include higher education agencies, nor productive sector.

University Sector: Includes higher education entities.

Research Institutes Sector: Includes public and private agencies, specifically dedicated to research and development activities.

Science and Technology Service: Includes public and private agencies which coordinate, sponsor and support scientific research activities.

Productive Sector: Includes national and foreign agencies, whose objective is to sell goods or services in any field of activity.

** The agencies that perform one or more of the following scientific and technological activities:

- Post-graduate education
- Research and experimental development
- Management and administration of research
- Support activities (statistics, inventories, norms, etc.).

2. Financial Resources

In Chart No. 2, the distribution of financial resources for research by sector is shown:

CHART No. 2

Financial Resources for Research by Sector, 1978

Sectors	Financial Resources	
	Amount (thousands of Col. pesos)*	%
Government	62,287	10.6
University	211,708	33.0
Research Institutions	237,375	37.0
Scientific and Technological Services	120,229	19.0
Productive Sector	3,121	0.4
TOTAL	640,720	100.0

* Average exchange rate for 1978 was Col.$39.25 = US$1.oo

Colciencias studies emphasize that although the amount spent on research has increased, research and development costs, as a percentage of the Gross National Product,has decreased. In 1972, research costs were 0.14% of the Gross National Product and in 1978 they only amounted to 0.07. In their opinion, the financial limitation efforts of the country with respect to research are even more evident if they are compared with other countries. Annex II shows the relation between research costs and the Gross National Product for various countries. In this way, comparisons can be established.

3. Human Resources*

In Chart No. 3, a summary of the distribution of human resources dedicated to scientific and technological activities and to research is presented. (It is necessary to remember that the human resources dedicated to research are part of a total classified under scientific and technological activities).

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* The classification of researchers by areas (Basic Sciences, Engineering Sciences, Health Sciences, Agricultural Sciencies, and Social Sciences), and by level of training, will be available about the end of July, 1980, when Colciencias will finish the tabulation of the data.

CHART No. 3

Human Resources Dedicated to Scientific, Technological and to Research Activities (1978)

Sectors	Human Resources			
	Scientific and technological activities		Research activities	
	No.	%	No	%
Government	626	15.7	181	7.5
University	1,972	49.5	1,451	60.1
Research Institutions	704	17.7	591	24.5
Scientific and Technological Services	476	12.0	165	6.8
Productive Sector	206	5.2	26	1:1
TOTAL	3,984	100.0	2,414	100.0

The number of university researchers in that chart, represents the 60.1% of the total researchers in the country. This group is followed in importance by the "research institutions" sector. It is deemed necessary to point out that while the universities have a 60.1% of the researchers in the country, they receive only 33% of the funds for research.

Annex III gives information by sector about the scientific and technological agencies as follows: Tables 1 to 5 list the agencies, their staff, the number of researchers and the number of research projects.

Tables 1A to 5A list the agencies and the researchers according to their professional level.

In 1978, out of a total of 2,414 researchers in the five sectors, 1,044 had a professional degree; 557 had gone through some type of specialization; 541 had a masters degree and 272 had a Ph.D degree.

The Colciencias study considers that, according to the number of researchers, research in Colombia is very limited. It also shows that the relation of the number of researchers per inhabitant is 0.9 researchers for 10,000. This index is considered rather low, especially if compared with other countries.

4. Number of Research Projects

Chart No. 4 shows the distribution of the number of projects of research by sector.

CHART No. 4

Number of Research Projects by Sector (1978)

Sectors	Projects of Research	
	No.	Distribution %
Government	51	3.6
University	917	64.1
Research Institutions	372	26.0
Scientific and Technological services	76	5.3
Productive Sector	15	1.1
TOTAL	1,431	100.0

The participation of the University in the execution of research projects is outstanding; it is followed in importance by the research institutions. The participation of the other sectors is not very significant.

5. General Summary

Chart No. 5 summarizes the research activities by sector.

CHART No. 5

General Summary of Research Activity (1978)

Sectors	Research Activities			
	No. of Agencies	Financial Resources*	No. researchers	No. Projects
Government	15	62,287	181	51
University	33	211,708	1,451	917
Research Institutions	23	237,375	591	372
Scientific and technological services	19	120,229	165	76
Production	3	3,121	26	15
TOTAL	93	640,720	2,414	1,431

* Average exchange rate for 1978 was Col.$39.25 = US$1.oo

II. Supply and Demand of Professional Researchers

According to the interviewed Colciencias staff, it is not possible to determine the lack or over-supply of research professionals, since there has been no study of the supply and demand of scientists and professional researchers, in general or in terms of academic degrees and areas of specialization. Therefore, in addition to the non-existence of pertinent documentation, none of the persons interviewed wished to venture an opinion with respect to this topic.

III. Scientific and Technological Policies, Programs and Priorities

1. Policies and Objectives 1/

"The general objective of the scientific and technological development policy is the application of science and technology to the strengthening of

1/ Taken from Document DNP-1-640-UDS-Colciencias. "Plan de Integración Nacional-Política de Ciencia y Tecnología". Bogotá, February 8, 1980. (Limited circulation).

the productive sector and its linkage to the development programs outlined by the government. To achieve this end, it will be attempted to create and strengthen a solid national research capacity and stimulate a wide process of technological innovation in Colombia. The strategy designed includes the following elements:

1.1 Develop programs oriented towards the strengthening of the capacity of the productive sector to evaluate, select, negotiate and assimilate the technology required by it. Special importance will be given to the aspects of technological information, technical assistance, and credit to the productive sector in order to support research and technological development programs related to its production problems.

1.2 Encourage the transfer and diffusion of technology, both foreign and domestic, to the production sector, with the goal of stimulating the knowledge and/or adapt said technology to the needs and conditions of the country.

1.3 Link the programs of scientific-technological development to the development programs of sectors included in the National Plan for Integration, such as agrarian and food supply policies, the educational sector, the industrial sector and that of renewable natural resources and energy.

1.4 Develop programs which are oriented toward strengthening in a selective way the national science and technology infrastructures through the support of research, the support of institutions that can contribute to this area, and through the development and betterment of the human resources that the country needs in order to carry out such activities."

2. Budget for Science and Technology

We can observe from the Colciencias documents on the different scientific and technological activities and from the National Plan for Science and Technology, the support of and the importance assigned to research, and within that, to the training of human resources. However, it is not possible to separate the specific amount assigned to the training of human resources.

Chart No. 6 presents the 1978 distribution of financial resources, by areas of science, in the different agencies of the sectors studied by Colciencias.

The figures given in this Chart refer only to research expenditures and do not include funding for other science and technology activities.

CHART No. 6

Financial Resources by Areas of Science (1978)

Areas of Science	Financial Resources	
	Value* Thousands Colombian Pesos)	Distribution %
Basic Sciences	180,139	28.1
Engineering Sciences	40,029	7.5
Health Sciences	107,487	16.8
Agricultural Sciences	180,795	26.3
Social Sciences	136,270	21.3
TOTAL	640,720	100.0

* Average exchange rate for 1978 was Col.$39.25 = US$1.oo

Source: Colciencias. El Sistema Científico y Tecnológico en Colombia, preliminary version; Bogotá, 1980.

Annex IV gives the projections for science and technology activities total expenditure for the period 1979-1982. These figures represent the global appropiations which include capital and functioning budgets; it also includes external funding for long term regional development programs. Although these figures cannot be compared with those of Chart No. 6, the amounts do express an increase in financial resources for science and technology general activities.

Moreover, universities will have to assign 2% of their total budget to research, according to the new higher education reform, approved in 1980.

3. Definition of Areas and Priority Programs

Based on the scientific and technological policy, the following areas and programs have been defined:

3.1 Strengthening of the national infrastructure in science and technology. Priority has been given to four programs:

3.1.1 Training of human resources: As a complement to the mechanisms for educational loans and scholarships that already exist, Instituto Colombiano de Crédito Educativo y Estudios Técnicos en el Exterior (Colombian Institute of Credit for Education and Foreign Technical Studies) - ICETEX, and Colciencias, are designing a special fund which would finance the training of researchers and technicians at academic centers, research institutes, factories or enterprises, both in the country and abroad.

The priorities and requirements of the human resources which derive from the mentioned programs will be the basis for orientation of the scholarship programs of ICETEX. The training of human resources at higher levels (graduate) within the country will be regulated by Instituto Colombiano para el Fomento de la Education Superior (Colombian Institute for Promoting Higher Education) - ICFES.

3.1.2 Information and diffusion of scientific and technological knowledge: Development of the National Information System giving special priority during 1980-1981 to four sectors: agriculture, energy sources, marine resources, and health.

3.1.3 Promotion of research at universities and research institutions, public and private, seeking to link the research activities of the country with the two main users of research results: the productive sector and the development programs of the government: In order to strengthen the capacity of the university to develop research programs, the higher education reform law, recently approved, stipulates that all universities should dedicate 2% of their budget to the financing of research.

In addition, Colciencias will encourage and give financial support to research programs in the universities and specialized research institutions.

3.1.4 Improvement of teaching and research in basic sciences: It is intended to improve the quality of teaching basic sciences at secondary education and university levels, and define a policy for post-graduate education in basic sciences.

Research in basic sciences will be promoted seeking to develop and relate this research with the applied programs for the development of science and technology, mentioned in the following section.

3.2 Application of science and technology to the development programs of the country.

The development plan of the country, called "Plan of National Integration", mentions three areas of governmental action that include development programs in different fields, thus:

3.2.1 Basic socio-economic needs: The first area relates to the basic needs in food, housing, education, and health.

a) National program of nutrition, food production and technology - The objective of the program is to contribute to activities which ensure the availability of food and the betterment of the nutritional situation of the country.

It will promote and finance research on production, storage, transport, marketing, and industrial processing of food.

It will give special priority to research on development and/or adaptation of production processes for the production of food of high nutritional content and low cost.

The research activities will be complemented by information and technical assistance programs for industry and by quality control of the final products.

b) Research programs related to housing and building materials - This program promotes and finances studies on policies, strategies and instruments which have been incorporated by the government sector into its activities related to housing.

c) Research, Innovation and Technology Program in the educational sector - This program will promote and finance projects related to:

- Research projects related to the educational process.
- Identification, analysis and diffusion of innovations or appropriate technologies in the field of education, which have been developed within the country or abroad.

d) Program of research in health - This program covers three main fields:

- Execution or support of research about the principal health problems in our nation and the relationship thereof with conditional factors.
- Provision of basic information in order to develop health and research policies at the national, regional and local level.
- Search for organizational and functional alternatives for the national health systems, which would assure higher rates of effectivity.

3.2.2 Use and preservation of natural resources: This second area includes programs in the fields of energy, marine resources, plant products, and the use and preservation of the principal ecosystems.

a) Program for research and development of energy resources

- Identify and evaluate energy alternatives which would correspond to the needs in this area.
- Develop the technological capacity to make better and more rational use of the traditional energy resources.
- Encourage and support projects which are oriented towards the development of non-traditional energy sources. Special attention will be given to projects of research and development of technology with respect to coal, hydroelectricity, hydrocarbons, solar energy, nuclear energy and biomass energy.

b) Development program for marine sciences and technology - The following topics will be covered:

- The systematic exploration of the seas and coastal regions, through the basic research and the applied research of marine ecosystems, their resources, fish and fishing techniques and conditioning factors such as pollution.
- Creation or strengthening of technological services which would support marine activities or the exploitation of its resources, such as marine cartography, information on marine resources, marine pollution control and marine meteorology..
- Training of human resources, at both technical and higher education levels for progra ms of marine and fishing development.

c) Program of research and development of plant resources - Its objective is to encourage and finance investigacion related to the search for, study and use of plant resources and their derivatives, in nutrition, health and industry. The program will include chemical, agricultural, pharmaceutical and engineering aspects.

d) Program of research for the conservation, use and recuperation of ecosystems - This program responds to the double need of rational use of natural resources of the principal ecosystems of the nation, and of protection of said ecosystems from excessive deterioration. Toward this goal, research projects will be financed and supported in the following aspects:

- Factors that influence the productivity of diverse ecosystems.
- Environmental impact of human activities and development programs.
- Processes and technologies related to the preservation and recuperation of ecosystems.

3.2.3 Scientific and Technological development programs related to production sectors: This area relates to two production sectors: technological innovation and development of the industrial sector, and generation, adaptation, adoption, and diffusion of technology in the agricultural sector.

a) Program of industrial technological development - Its objective is to encourage and support a wide process of technological innovation in the industrial sector, in order to improve its products, the efficiency of its production processes, and the optimum utilization of raw materials and production elements available in the country.

Activities to be encouraged:

- Projects oriented toward the strengthening of the capacity of the Colombian industries to evaluate, select, negotiate and assimilate the acquired technology (from domestic as well as from foreign sources). Special importance will be given to programs of industrial technological information, technical assistance (principally to small and medium industry), and credit to the production sector, in order to finance technological development and research projects related to problems of production.

  These programs will be carried out through Servicio Nacional de Aprendizaje (National Training Service) SENA, the Instituto de Investigaciones Tecnológicas (Technical Research Institute) - IIT, the Corporación Financiera Popular (Financing Corporation for Low-Income People), Fondo Nacional de Proyectos de Desarrollo (National Fund for the Development of Projects) - FONADE, Fondo de Promoción de Exportaciones de Colombia (Fund for Promoting Colombian Exportations) - PROEXPO, and Colciencias, in collaboration with industry.

- The transfer and diffusion of technology to the industrial sector (from both domestic and foreign sources) in order to improve productivity and strengthen its competitiveness in the international markets.

- The promotion and support of technological development and research projects in certain industrial sectors. It is expected to balance the flow of foreign technology with a national capability to adapt said technology to the conditions of the country, and to generate new technology with respect to areas, sectors or products of national interest.

- The promotion of collaboration between state enterprises and the private sector, in order to identify and analyze possibilities of buying capital goods and engineering services which are produced or provided by Colombian know-how.

b) Agro-forestry programs

IV. Activities for the Training of Human Resources

With respect to the training of human resources, the following observations can be made:

As stated before, the science and technology plan, recently defined by Colciencias and approved in 1980 by the National Council of Economic and Social Policy, assigns an important priority to the improvement of the research capacity of the nation, in terms of infrastructure as well as in terms of the training of human resources in the areas to which priority has been given.

Up to now, and previous to the approval of this plan, it can be said that the training of human resources, at academic levels and in areas of specialization, had never been subject to any official planning policy.

In this respect, a 1978 Colciencias study points out the following: 1/ "There is not yet a functional relation between the number and kinds of scholarships processed in the various subject areas, with the teaching, research and technological priorities of the country. This relation would obey to a plan, no matter how general, of the indicated needs". Further on, the same document adds, "Presently, the selection processes (for scholarships) work in response to isolated demands of persons and agencies generated, in most cases, by the offers of international programs and agencies (...) that Icetex informs through its local offices".

The larger universities, such as the Universidad del Valle and the Universidad Nacional, have some organization in their graduate program, which is planned. The organization and planning obeys to internal academic needs

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1/ Ahumada, Jorge G. "Plan de Impulso a la Investigación en la Universidad Colombiana. Bases para un Programa Nacional de Formación y Perfeccionamiento de Docentes-Investigadores (Preliminares)". Colciencias, Bogotá, July, 1978.

which do not necessarily, or generally coincide with the needs of the country and its areas of priority. In spite of the existence of certain planning, these universities do not escape the previously described phenomena, that is, the dependency on scholarships offered by foreign agencies, for the purpose of the training of their human resources.

In the same document Colciencias proposes the bases for a National Program for Training and Improvement of Teachers Reasearchers with special emphasis on priority areas of science and technology. The universities would receive an important support for the implementation of the program.

Other aspects to be considered with relation to the questions about training of human resources are the following:

1. According to the opinions of interviewed Colciencias staff, there are no ignored research areas among those which conform the group defined as important areas.

2. Due to the importance of the university in the training and specialization of human resources, the Colciencias interviewees considered that, generally, training is designed for the general betterment of education.

V. Projections with Respect to the Demand for Human Resources for Research

It is not possible to establish if the nation, in the coming years, will be able to satisfy the demand for scientific personnel, since there does not exist, as has been previously noted, a study of supply and demand in relation with this area. However, it is important to point out that Colciencias has been working with Icetex in creating awarness about the need for such study. Meanwhile, none of the persons interviewed think is possible to make a projection.

VI. General Considerations in Relation to Training: Needs by Area, Place of Training, Type of Training

1. Needs by Area

In terms of areas of scpecialization, the needs for training human resources can be inferred by the areas that are listed as priority areas in the Plan for Research in Science and Technology, mentioned before under III-3.

2. Place of Training

Training can be carried out abroad or in the country, depending on the area of sciences the training is to take place. For example, in the case of social sciences, training may be carried out in this country. In the case of basic sciences, and according to the degree of specialization, the training should probably be done abroad. In the Colciencias document 1/, it is explicitly established that, "it will be expected that, in the cases which require a thesis as a pre-requisite for a degree, the thesis should bear a direct relation to the problems detected at national level".

A study carried out by the National Planning Department 2/, presents three alternatives, which could help strengthening the scientific capacity of the country:

2.1 To import scientists from developed countries

The document considers that "this possibility is not attractive for various reasons, among them, because the country would have to pay very high salaries, to compete with the international market".

2.2 To send personnel abroad for training in the cases stated before.

2.3 Training within the country

This one is considered as the solution in the long term. It implies a long period of time as well as very large investments.

The combination of the last two alternatives partially resolves the problem of training of human resources. It is deemed partial because of the high brain drain that research institutions constantly face. Hence, measures to counteract this tendency are in great need.

3. Type of Training

With respect to the universities, to which the Colciencias document 3/ makes specific reference, the following types of training and capacitation are mentioned:

1/ Ahumada, B. Jorge, Op. cit.

2/ DNP, "Plan Nacional de Investigaciones Agropecuarias", working document, for discussion. Preliminary version, Unidad de Estudios Agrarios, 1979.

3/ Ahumada, B. Jorge, Op. cit.

3.1 Graduate studies for junior researchers, including the research component and, if necessary, training in teaching methods.

3.2 Further training of senior researchers, in specific areas of science or technology, directly related to their own topics of work and interest.

3.3 "Interships" or short trips through which the researcher and/or professor can bring himself up to date with respect to a given speciality or technological development.

In addition, the criteria established that "Upon his return to the country, the agency of origin should include the person who received the scholarship in the plans, activities and projects for which he received training and experience".

VII. Obstacles that Limit the Development and the Results of Scientific and Technological Activities

1. General Level

The main factors which have influenced low achievements in the management of science and technology are:*

1.1 Lack of clear medium and long-term policies which would gear scientific and technological activities toward the sectors which have been defined as priority sectors for the development of the country.

1.2 Insufficient funds for the execution of the formulated programs. In Colombia, levels of 0.1 % of the Gross National Product (GNP) are invested in scientific development programs, while in other countries, in similar conditions of development, between 0.7% and 1% of the GNP is dedicated to these activities. Industrialized countries invest 3% or more of their GNP.

1.3 Weak relationship between the institutes which carry out scientific-technological activities (universities, research centers) and the principal users of these services and knowledge: the productive sector and the government development programs. However, the government in order to make decisions has increasingly relied upon the existent research infrastructure.

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* Taken from: Document DNP-1-640-UDS-Colciencias. "Plan de Integración Nacional - Política de Ciencia y Tecnología", Bogotá, February 8, 1980. (Restricted circulation).

1.4 Lack of adequate mechanisms which would transfer technology to the productive sector, in order that there be a real utilization and assimilation of the available technological knowledge.

1.5 An almost exclusive assignment of the financial resources of the universities to teaching and administration. This has had negative influence in the training of the human resources necessary to the development of the country, in terms of research, and in terms of linking the university to the development programs.

2. University Level

Since the university is an important center for scientific activity and for the training of human resources in research, it is necessary to enumerate the obstacles that limit its research development.

Based on the study made by Colciencias on research at the Colombian university 1/, the following obstacles can be pointed out and classified as either financial, institutional and socio-cultural ones. They are:

2.1 Financial obstacles

-University does not give research the necessary budgetary importance. 2/.

-Lack of incentives for professors and researchers.

2.2 Institutional obstacles

-Teaching is given more importance than research.

-Small number of professor-researchers.

-Graduate work is not centered on research.

-The university lacks mechanisms for the promotion and coordination of research.

-Deficient laboratory equipment.

1/ Colciencias, "La Investigación en la Universidad Colombiana", Bogotá, 1978.

2/ As one of the measures of the new university reform statutes, it was established that the universities must dedicate 2% of the budget to research.

-Lack of good libraries and adequate sources of documentation and information in general.

-Lack of opportunities to attend international scientific meetings, seminars and symposiums.

-Deficiency in the diffusion of scientific work.

2.3 Socio-Cultural obstacles

-Lack of recognition by society, of the researcher's work.

-Deficient linkages with the community.

VIII. Problem due to Dedication of Researchers to Other Activities

A monograph on Colombia, presented by Colciencias to the United Nations Conference on science and technology for development, celebrated in Vienna, 1978 1/ points out that, "Due to difficulties of employment in certain branches of production or services; or simply due to the low capacity of absorption of highly qualified human resources, it is not surprising that researchers go to areas other than those for which they were trained. This determines a limited utilization of such resources. In the industrial sector, given the relatively routinary functions required for the application of foreign-acquired technology, combined with the fact that administrators are assigned a superior status compared to the technicians, there is a combination of factors which causes the engineer to frequently look for an administrative position. Such phenomena of "internal flights" evidently lessen the capacity of application of scientific and technological knowledge to the problems of development".

IX. Role of Foreign Researchers in the National Context

According to the people interviewed in Colciencias, there are two major aspects to be mentioned: 1) From the qualitative point of view of research, the foreign personnel can be considered as an important source of human resources. 2) From the quantitative point of view, they do not represent a significant and fundamental source of human resources within the country.

1/ Monografía de Colombia, Vol. 3, No. 2. April-June, 1979, Bogotá.

X. Problem of Migration of Human Resources Trained for Research

The areas of priority in human resources training, which derive from the Research Plan have already been pointed out. It is evident that more training of human resources is needed. However, hand in hand with the problem of needs, in the sense of adequate training, we have to face the problem of trained human resources who are no longer in the country. The Vienna monograph on Colombia 1/, points out that, "The productive sector provides an adequate and deficient absorption of people who have complete different levels of education; consequently, the migration of professionals, technicians and skilled workers has increased, with resultant losses for the country (...). With relation to this, between 1954 and 1975, 8,806 professionals and technicians migrated to the United States alone, which implied, from the economic point of view, the loss of US$176,120,000 for the nation, if it is taken into account that the training of a high-level specialist costs approximately US$20,000.

1/ Monografía de Colombia, Op. cit.

ANNEX I

COLCIENCIAS - Colombian Fund for Scientific Research and Special Projects (named after Francisco José de Caldas, a distinguished scientist and patriot of the late 18th and early 19th century).

COLCIENCIAS was established by Executive Decree No. 2869 in November 1969, following consultations with the Colombian scientific community as well as representatives of similar scientific organizations in other countries, which had led early in 1968 to the First Colombian Seminar on Science and Technology for Development, jointly sponsored by the Colombian Government, the Agency for International Development and the United States National Academy of Sciences. At the same time, the National Council for Science and Technology (CONCYT) was created, COLCIENCIAS acting as executive secretary for the Council. The Council, composed of 18 members, presided by the President of the Republic and including five Ministers, would be responsible for establishing national science policies; whereas COLCIENCIAS, in addition to its main goal of promoting and funding scientific and technological research, would also prepare the studies required by the Council. Due to the fact that the Council has met very seldom, COLCIENCIAS has in practice assumed the functions both as a funding agency and as a Council for science and technology policy.

COLCIENCIAS is an autonomous decentralized institute, attached to the Ministry of Education and receives a direct allocation from the Bureau of the Budget. Its Board of Directors, presided by the Minister of Education, includes four personal representatives of the President of the Republic; the Director of the Colombian Institute for the Advancement of Higher Education (ICFES); a representative from the Director of the National Planning Department and the Director of COLCIENCIAS, who is himself a personal appointee of the President.

For the purpose of evaluating the research projects submitted to COLCIENCIAS as well as advising in matters of science policies and activities, COLCIENCIAS appoints the members of the Advisory Council on Scientific Research. This body is composed of approximately 30 outstanding investigators from different institutions located throughout the country and is divided in five (5) standing committees according to the areas in which COLCIENCIAS finances research: basic sciences, engineering, health, agricultural and social sciences.

Grants for research projects are awarded to institutions (mainly universities). After an internal review by COLCIENCIAS, proposals are submitted for evaluation to committee members of the Advisory Council or to outside referees

(peer review). Whenever several projects emerge in an area of national importance or interest, coming from several institutions and including different disciplines or areas of science, COLCIENCIAS can constitute a "special program" and, if deemed necessary, request that the Government qualify it, by decree or Executive Order, as a "special project" to which independent resources can be allocated. To date, three special projects have been qualified as such: the National Information System; the Marine Research Program, located at INVEMAR in Santa Marta, and the National Program on Population and Environment. In the stage of special programs are the following: Food Technology and Nutrition; Housing and Building Materials; Metalurgy and the Metal-Working Industry and Educational Technology.

To date, COLCIENCIAS has approved more than 700 research projects, awarding approximately US$3 million in grants. This figure, however, is not wholly representative of the amount spent in research in the past 10 years, since COLCIENCIAS acts as a co-financing agency, obtaining support from other institutions for its projects. A 1977 survey of university research in Colombia showed that of the total of 188 million pesos (approximately US$4.5 million) spent by universities on research during that year, COLCIENCIAS had contributed an average of 20%, comparable to the contribution of other national and international agencies.

In addition to the direct financial support received from the Bureau of the Budget, COLCIENCIAS also obtains and channels funds from several international agencies. The OAS has helped to promote projects on scientific and technological instruments for development as well as technological development in specific areas such as the metal working industry and paper pulp conversion. UNESCO-UNDP has collaborated in projects on scientific and technological information systems, on science and technology policy, and science education. Other agencies such as the International Foundation for Science and FORGE have requested that COLCIENCIAS serve as national linkage institution in selecting and evaluating their Colombian research project requests.

Since 1973 COLCIENCIAS in conjunction with the National Science Foundation of the United States has fostered a cooperative research program, which strives to support mutually beneficial research projects, jointly designed and collaboratively carried out by group of scientists from the two countries. Eleven (11) joint projects have been approved thus far; the National Science Foundation giving support to the United States recipients and COLCIENCIAS to the Colombian counterpart group. Binational research agreements of this type are also in operation with Venezuela and Brazil, the latter on an informal basis.

COLCIENCIAS also performs a number of intra-mural research activities related to scientific and technological aspects of national interest. Its Division of Basic Studies and Human Resources carried out, from 1971 on, a general survey of scientific and technological resources in the country, the results of which have been published in several volumes. The same Division is currently concerned with professional supply and demand in careers such as Agronomy, Engineering, Architecture, and Medicine as well as studies on training of technicians at the intermediate levels. It also has carried out some initial studies related to the "brain-drain" problem. Other Divisions carry out studies related to the above-mentioned "special programs and projects".

In addition to the aforementioned activities, COLCIENCIAS also organizes meetings, seminars and short courses for the exchange of scientific information within the country and supports scientific visits of both Colombian and foreign professionals for the purpose of planning scientific activities, as well as travel support to attend national, regional and international scientific events. Support is also given for publishing the results of outstanding research projects and periodical scientific publications.

As the national center for the National Information System on Science and Technology, COLCIENCIAS not only offers researchers easy accessibility to published and unpublished documents but also coordinates several specialized information services in areas such as health, agriculture, education, economics and social sciences, as well as food and industrial technologies. In addition, it acts as national representative of the National Technical Information Service (NTIS) of the United States.

Since 1978 COLCIENCIAS is located in its own building, at Transversal 9a. No. 133-28 in Bogotá, where, besides offices for its 75 employees, it has a library and several meeting rooms available to the scientific community.

ANNEX II

Relation Between Research and Development Expenditure and Gross National Income, for Some Countries

Country	Year	Expenditure in R&D as % of N.G.P.
United States	1966	3.0
URSS	1967	2.7
Czechoslavakia	1967	2.7
Great Britain	1967	2.3
Holand	1967	2.3
France	1967	2.2
Federal Germany	1967	1.9
Hungary	1967	1.7
Japan	1967	1.5
Sweden	1967	1.4
Polony	1967	1.4
Canada	1967	1.5
Denmark	1967	0.7
Italy	1967	0.7
Argentina	1968	0.28
Trinidad	1970	0.24
Spain	1971	0.20
Paraguay	1971	0.22
Colombia	1972	0.14
Jamaica	1971	0.10
Dominican Republic	1972	0.12

Source: Colciencias. "El Sistema Científico y Tecnológico de Colombia". Bogotá, 1980.

ANNEX III

Table 1

Government Sector

Professional Staff in Scientific and Research Activities, Number of Researchers and Research Projects, by Agency, 1978

AGENCY	Active Personnel S&T	%	No. and % of Researchers		No. & % of Research Projects	
Inst. Col. de Bienestar Familiar	25	4.0	21	11.6	2	3.9
Inst. Col. de Comercio Exterior	40	6.4	28	15.5	5	9.8
Inst. Col. de Construcciones Escolares	4	0.6	3	1.7	1	2.0
Instituto de Crédito Territorial	2	0.3	-	-	-	-
Inst. Col. de Energía Eléctrica	5	0.8	-	-	-	-
Inst. Col. de la Reforma Agraria	19	3.0	-	-	-	-
Inst. de los Seguros Sociales	29	4.6	4	2.2	2	3.9
Instituto de Fomento Industrial	14	2.2	-	-	-	-
Inst. Nal. de Fomento Municipal	29	4.6	-	-	-	-
Instituto Nacional del Transporte	4	0.6	4	2.2	1	2.0
Administración Postal Nacional	6	1.0	-	-	-	-
Super Cooperativas	8	1.3	-	-	-	-
Superanónimas	30	4.8	12	6.6	2	3.9
Caja Nacional de Previsión	18	2.9	16	8.8	3	5.9
Departamento Nal. de Planeación	66	10.5	19	10.5	10	19.6
Dept. Adm. del Servicio Civil	4	0.6	-	-	-	-
Mingobierno	13	2.1	-	-	-	-
Minrelaciones	5	0.8	-	-	-	-
Minjusticia	11	1.8	-	-	-	-
Minhacienda	2	0.3	-	-	-	-
Minagricultura	12	1.9	12	6.6	3	5.9
Mintrabajo	5	0.8	4	2.2	2	3.9
Minsalud	125	20.0	14	7.7	10	19.6
Minminas	3	0.5	3	1.7	1	2.0
Mincomunicaciones	4	0.6	3	1.7	1	2.0
Minobras	21	3.4	7	3.9	1	2.0
Fondo Nacional Hospitalario	12	1.9	-	-	-	-
Mineducación	110	17.6	31	17.1	7	13.6
TOTAL	626	100.0	181	100.0	51	100.0

ANNEX III

Table 1-A

Government Sector

Number of Researchers, Professional Level, by Agency, 1978

AGENCY*	Total	PROFESSIONAL LEVEL			
		Profs.	Specits.	Master	Ph.D
Caja Nacional de Previsión	16	-	16	-	-
Departamento Nacional de Planeación	19	10	-	8	1
Inst. Col. de Bienestar Familiar	21	10	4	7	-
Inst. Col. de Comercio Exterior	28	22	3	2	1
Inst. Col. de Construcciones Escolares	3	3	-	-	-
Instituto de los Seguros Sociales	4	-	4	-	-
Instituto Nacional del Transporte	4	4	-	-	-
Minagricultura	12	6	1	5	-
Mincomunicaciones	3	3	-	-	-
Mineducación	31	6	19	4	2
Minas y Energia	3	2	1	-	-
Minsalud	14	2	3	9	-
Minobras	7	2	4	1	-
Mintrabajo	4	4	-	-	-
Superanónimas	12	8	4	-	-
TOTAL	181	82	59	36	4

* The list includes those government agencies which are involved in research activity (15 out of 28).

ANNEX III

Table 2

University Sector

Professional Staff in Science and Technology Activities, Number of Researchers and Research Projects by University, 1978

AGENCY	Active Personnel S&T	No. and % Researchers		No. & % of Research Projects	
Universidad Nacional					
Bogotá	441	408	28.1	282	30.8
Medellín	82	67	4.6	45	4.9
Palmira	6	7	0.5	4	0.4
Sub-Total Universidad Nacional	529	482	33.2	331	36.1
Universidad de Córdoba	6	6	0.4	3	0.3
Universidad del Valle	273	204	14.1	128	14.0
Universidad de Antioquia	174	135	9.3	102	11.1
Universidad de Los Andes	168	81	5.6	69	7.5
Universidad Pontificia Javeriana	170	52	3.6	36	3.9
Universidad Industrial de Santander	137	126	8.7	79	8.6
Universidad de Cartagena	76	67	4.6	29	3.2
Universidad del Cauca	63	47	3.2	20	2.2
Universidad Pedagógica Nacional	43	34	2.3	7	0.8
Universidad del Norte	38	19	1.3	5	0.6
Universidad de Nariño	30	30	2.1	12	1.3
Universidad Pedagógica y Tecnológica de Colombia	29	23	1.6	14	1.5
Escuela Naval Almirante Padilla	23	19	1.3	4	0.4
Colegio Mayor Nuestra Señora del Rosario	22	-	-	-	-
Universidad Tecnológica del Magdalena	20	14	1.0	10	1.1
Universidad Francisco de Paula Santander	21	14	1.0	14	1.5
Universidad del Tolima	19	16	1.1	16	1.7
Universidad Libre Seccional Atlántico	15	11	0.8	2	0.2
Universidad del Atlántico	12	8	0.6	2	0.2
Escuela de Administración y Finanzas EAFIT	13	4	0.3	3	0.3
Universidad Externado de Colombia	10	9	0.6	2	0.2
Universidad de Pamplona	11	7	0.5	4	0.4
Fundación Universidad Jorge Tadeo Lozano	11	6	0.4	2	0.2
Universidad de Caldas	11	11	0.8	3	0.3
Universidad Sur Colombiana	10	3	0.2	1	0.1
Universidad Pontificia Bolivariana	8	4	0.3	5	0.6

AGENCY	Active Personnel S&T	No. and % Researchers		No. & % of Research Projects	
Universidad Tecnológica de Pereira	5	5	0.3	2	0.2
Universidad Distrital Francisco José de Caldas	5	5	0.3	1	0.1
Escuela Colombiana de Ingeniería	4	4	0.3	5	0.6
Escuela Superior de Administración Pública - ESAP	4	-	-	-	-
Universidad del Quindio	4	4	0.3	5	0.6
Universidad Autónoma del Caribe	3	-	-	-	-
Universidad de Medellín	1	-	-	-	-
Universidad Autónoma Latinoamericana	1	-	-	-	-
Universidad San Buenaventura	1	-	-	-	-
Universidad Tecnológica de los Llanos Orientales	1	1	0.1	1	0.1
Universidad Santo Tomás	1	-	-	-	-
TOTAL	1,972	1,451	100.0	917	100.0

ANNEX III

Table 2-A

University Sector

Number of Researchers, Professional Level, by Agency, 1978

AGENCY	Total	PROFESSIONAL LEVEL			
		Profs.	Specits.	Master	Ph.D
Universidad de Cordoba	6	3	2	1	-
Universidad Nacional					
Bogotá	408	166	106	76	60
Medellín	67	41	10	9	7
Palmira	7	2	2	3	-
Sub-Total Universidad Nacional	482	209	118	88	67
Universidad del Valle	204	67	28	69	40
Universidad de Antioquia	135	48	47	34	6
Universidad de Los Andes	81	20	5	28	28
Universidad Pontificia Javeriana	52	5	21	18	8
Universidad Industrial de Santander	126	55	14	39	18
Universidad de Cartagena	67	20	35	11	1
Universidad del Cauca	47	25	15	7	-
Universidad Pedagógica Nacional.	34	15	-	19	-
Universidad del Norte	19	8	5	3	3
Universidad de Nariño	30	8	9	12	1
Universidad Pedagógica y Tecnológica de Colombia	23	4	3	10	6
Escuela Naval Almirante Padilla	19	12	4	2	1
Universidad Tecnológica del Magdalena	14	5	4	1	4
Universidad Francisco de Paula Santander	14	-	10	4	-
Universidad del Tolima	16	8	2	6	-
Universidad del Atlántico	8	-	6	2	-
Escuela de Administración y Finanzas EAFIT	4	-	-	4	-
Universidad Externado de Colombia	9	-	9	-	-
Universidad de Pamplona	7	-	4	3	-
Fundación Universidad Jorge Tadeo Lozano	6	-	3	3	-
Universidad de Caldas	11	4	6	1	-
Universidad Surcolombiana	3	3	-	-	-
Universidad Pontificia Bolivariana	4	1	2	-	1

AGENCY	Total	PROFESSIONAL LEVEL			
		Profs.	Specits.	Master	Ph.D
Universidad Tecnológica de Pereira	5	5	-	-	-
Universidad Distrital Francisco José de Caldas	5	1	2	2	-
Escuela Colombiana de Ingeniería	4	1	-	2	1
Universidad del Quindio	4	1	-	3	-
Universidad Tecnológica de los Llanos Orientales	1	-	-	1	-
Universidad Libre Seccional Atlántico	11	1	10	-	-
TOTAL	1.451	529	364	373	185

ANNEX III

Table 3

Research Centres or Institutions

Professional Staff in Science and Technology Activities, Number of Researchers and Research Projects, by Agency

1978

AGENCY	Active Personnel S&T	No. & % of Researchers		No. & % Research Projects	
Public Agencies					
Instituto Caro y Cuervo	19	19	3.2	4	1.1
Instituto Colombiano Agropecuario	262	236	39.9	197	53.0
Instituto de Asuntos Nucleares	33	20	3.4	7	1.9
Inst. Investigaciones Marinas - INVEMAR	13	13	2.2	6	1.6
Inst. Nal de Cancerología	15	15	2.5	5	1.3
Inst. Nal. de Invest. Geológicas y Mineras	27	8	1.4	6	1.6
Instituto Nacional de Salud	54	54	9.1	20	5.4
Jardín Botánico J.A. Uribe	1	1	0.2	1	0.3
Jardín Botánico del Valle "JMC"	7	7	1.2	6	1.6
Sub-Total	431	373	63.1	252	67.7
Private Agencies					
Centro de Invest. y Educación Popular	9	5	0.9	2	0.5
Centro de Educación No Formal	17	5	0.9	3	0.8
Corporación Centro Regional de Población	43	36	6.1	26	7.0
Corp. Nal. de Investigaciones y Fomento Forestal	9	9	1.5	6	1.6
Fundación para la Educación Superior y el Desarrollo	22	22	3.7	10	2.7
Inst. de Integración Cultural	8	5	0.9	4	1.1
Inst. de Invest. Científico-Técnica - INCITEC	5	1	0.2	4	1.1
Inst. Geofísico de los Andes	3	3	0.5	3	0.8
Inst. Neurológico Colombiano	12	9	1.5	6	1.6
Inst. SER de Investigaciones	18	17	2.9	8	2.2
Jardín Botánico José C. Mutis	2	2	0.3	1	0.3
Oficina de Estudios Económicos y Legales	14	5	0.9	2	0.5
Sub-Total	162	119	20.1	75	20.2
Mixed Agencies					
Oficina de Investigaciones Técnicas	51	39	6.6	40	10.8
Sub-Total	51	39	6.6	40	10.8
International Agencies					
Centro Internacional de Agricultura Tropical	60	60	10.2	5	1.3
Sub-Total	60	60	10.2	5	1.3
TOTAL	704	591	100.0	372	100.0

ANNEX III

Table 3-A

Research Centres or Institutions

Number of Researchers, Professional Level, by Agency, 1978

AGENCY	Total	PROFESSIONAL LEVEL			
		Profs.	Speciats.	Master	Ph.D
Instituto Caro y Cuervo	19	15	-	1	3
Instituto Colombiano Agropecuario ICA	236	154	6	63	13
Instituto Asuntos Nucleares - IAN	20	6	8	3	3
Instituto Investigaciones Marinas-INVEMAR	13	8	-	1	4
Instituto Nacional de Cancerología	15	7	8	-	-
Instituto Nacional Investigaciones Geologicas y Mineras - INGEOMINAS	8	3	5	-	-
Instituto Nal de Salud - INAS	54	27	17	7	3
Jardín Botánico J.A. Uribe (Medellín)	1	-	-	1	-
Jardín Botánico del Valle "JMC"	7	6	1	-	-
Sub-Total Public Agencies	373	226	45	76	26
Centro Investig. y Educación Popular CINEP	5	3	-	1	1
Centro de Educación no Formal - CEPEC/CEDEN	5	1	-	3	1
Corporación Centro Regional Población CCRP	36	14	4	7	11
Corporación Nacional Investigaciones y Fomento Forestal - CONIF	9	8	1		
Fundación Educación Superior y Desarrollo - FEDESARROLLO	22	-	7	7	8
Instituto Integración Cultural	5	4	-	-	1
Instituto Investigaciones Científicas Técnicas - ICINTEC	1	-	-	-	1
Instituto Geofísico Andes	3	-	-	-	3
Instituto Neurológico Colombiano	9	1	5	3	-
Instituto SER de Investigaciones	17	2	8	1	6
Jardín Botánico José C. Mutis	2	-	-	2	-
Ofi. de Estudios Económicos y Legales	5	4	1	-	-
Sub-Total Private Agencies	119	37	26	24	32

AGENCY	Total	PROFESSIONAL LEVEL			
		Profs.	Speciats.	Master	Ph.D
Instituto Investigaciones Técnicas IIT	39	12	19	6	2
Sub-Total Mixed Agencies	39	12	19	6	2
Centro Internacional de Agricultura Tropical - CIAT	60	25	-	12	23
Sub-Total International Agencies	60	25	-	12	23
TOTAL	591	300	90	118	83

ANNEX III

Table 4

Science and Technology Services

Professional Staff in Science and Technology Activities, Number of Researchers and Research Projects, by Agency

1978

AGENCY	Active Personnel S&T	No. and % of Researchers		No. and % of Research Projects	
Total	476	165	100.0	76	100.0
Public Agencies	393	125	75.8	56	73.7
Centro Interamericano de Foto-interpretación - CIAF	7	3	1.8	1	1.3
Corporación Autónoma Regional del Quindio	6	6	3.6	2	2.6
Corporación Autónoma Regional de la Sabana - CAR	23	8	4.9	6	7.9
Corporación Autónoma Regional Valle del Cauca - CVC	41	32	19.4	14	18.4
Corporación Autónoma Defensa Manizales - CRAMSA	4	4	2.4	3	4.0
Corporación Eléctrica Costa Atlántica - CORELCA	6	-	-	-	-
Corporación Regional Desarrollo Uraba - CORPOURABA	12	6	3.6	4	5.3
Corporación Regional Valle del Sinú - CVS	6	4	2.4	2	2.6
Corporación Regional Defensa Meseta Bucaramanga	1	-	-	-	-
Departamento Adm. Nacional de Estadística	28	-	-	-	-
COLCIENCIAS	30	-	-	-	-
ICETEX	6	-	-	-	-
Inst. de Hidrología, Metereología y Adec. de Tierras	63	6	3.6	3	4.0
Inst. Col. de Fomento de la Educación Superior	15	-	-	-	-
Inst. de Des. de los Recursos Naturales Renovables	26	18	10.9	5	6.6
Instituto Geográfico Agustín Codazzi	39	9	5.5	3	4.0
Servicio Nacional de Aprendizaje	47	8	4.9	8	10.5
Instituto Colombiano de Cultura	33	21	12.7	5	6.6

AGENCY	Active Personnel S&T	No. and % of Researchers		No. and % of Research Projects	
Private Agencies	83	40	24.2	20	26.3
Academia Colombiana de la Lengua	7	6	3.6	1	1.3
Asoc. Colombiana de Facultades de Medicina	7	6	3.6	5	6.6
Asociación Col. para el Estudio de la Población	4	4	2.4	1	1.3
Centro Interindustrial de Desarrollo Urbano - CIDURBE	3	-	-	-	-
Centro Estadístico Nal. de la Construcción	29	18	10.9	9	11.8
Fondo Fomento Investigaciones Científicas y Tecnológicas - FICITEC	5	2	1.2	2	2.6
Instituto Colombiano de Desarrollo Social - ICODES	7	2	1.2	1	1.3
Instituto Colombiano Normas Técnicas	21	2	1.2	1	1.3

ANNEX III

Table 4-A

Science and Technology Services

Number of Researchers, Professional Level, by Agency, 1978

AGENCY	Total	PROFESSIONAL LEVEL			
		Profs.	Specits.	Master	Ph.D
Corp. Autónoma Regional de la Sabana	8	5	3	-	-
Instituto Colombiano de Cultura	21	20	1	-	-
Inst. de Des. de los Rec. Naturales Renovables	18	17	1	-	-
Instituto Geográfico Agustín Codazzi	9	1	5	3	-
Servicio Nacional de Aprendizaje	8	8	-	-	-
Inst. de Hidrología, Metereología y Adec. Tierras	6	4	2	-	-
Corporación Autónoma Defensa Manizales	4	4	-	-	-
Centro Regional Quindio	6	6	-	-	-
Corporación Regional de Desarrollo de Urabá	6	5	1	-	-
Corporación Regional Valles Sinú, y San Jorge CVS	4	2	2	-	-
Centro Interamericano de Foto Interpretación	3	-	1	2	-
Corp. Autónoma Regional del Valle del Cauca	32	20	10	2	
Sub-Total Public Agencies	125	92	26	7	-
Instituto de Desarrollo Social	2	1	1	-	-
Asoc. Colombiana para el Estudio de la Población	4	4	-	-	-
Fondo de Fomento a la Inv. Cient. y Tecnológica	2	-	-	2	-
Centro Estadístico Nal. de la Construcción	18	16	2	-	-
Academia Colombiana de la Lengua	6	-	6	-	-
Asoc. Col. de Facultades de Medicina	6	1	-	5	-
Instituto Colombiano de Normas Técnicas	2	1	1	-	-
Sub-Total Public Agencies	40	23	10	7	-
TOTAL	165	115	36	14	-

ANNEX III

Table 5

Productive Sector

Staff in Scientific and Technological Activities, Number of Researchers and Research Projects, by Agency, 1978

AGENCY	Active Personnel S&T	No. and % of Researchers		No. and % of Research Projects	
Total	206	26	100.0	15	100.0
Public Agencies	198	18	69.2	9	60.0
Banco Central Hipotecario - BCH	4	-	-	-	-
Caja Crédito Agrario	1	-	-	-	-
Corporación Financiera Fomento Agrícola - COFIAGRO	5	-	-	-	-
Corporación Financiera del Transporte	5	-	-	-	-
Corporación Nacional de Turismo - CORTURISMO	11	-	-	-	-
Empresa Colombiana de Telecomunicaciones - TELECOM	38	-	-	-	-
Empresa Puertos de Colombia - COLPUERTOS	41	-	-	-	-
Ferrocarriles Nacionales	7	2	7.7	1	6.7
Hospital Militar Central	80	16	61.5	8	53.3
Instituto Mercadeo Agropecuario	6	-	-	-	-
Mixed Agencies	8	8	30.8	6	40.0
Empresa Colombiana de Productos Veterinarios - VECOL	8	8	30.8	6	40.0

ANNEX III

Table 5-A

Productive Sector

Number of Researchers, Professional Level, by Agency

1978

AGENCY	Total	PROFESSIONAL LEVEL			
		Profs.	Spects.	Master	Ph.D
Ferrocarriles Nacionales	2	2	-	-	-
Hospital Militar Central	16	8	8	-	-
Sub-Total Public Agencies	18	10	8	-	-
Empresa Col. de Productos Veterinarios	8	8	-	-	-
Sub-Total Mixed Agencies	8	8	-	-	-
TOTAL	26	18	8	-	-

ANNEX IV

Budgetary Allocations for Science and Technology: 1979-1982

(In millions pesos)

	1979	1980	1981	1982	Total
National Budget Allocations	1.820	2.142	2.677	3.346	9.985
Own Resources	2.541	3.176	3.970	4.964	14.651
TOTAL	4.361	5.318	6.647	8.310	24.636

Source: Apropiaciones Presupuestales para Ciencia y Tecnología; Bogotá, COLCIENCIAS document - PPCT - 014, 1979. Projections to 1982 are based on National Planning Department Data.

INSTITUTO COLOMBIANO AGROPECUARIO - ICA

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INSTITUTIONAL INTERVIEW

INSTITUTO COLOMBIANO AGROPECUARIO - ICA

I. INTRODUCTION

In order to carry out the study of the Instituto Colombiano Agropecuario, ICA, the national agency in charge of agricultural research, two basic methods were used: interviews and the analysis of the existing documentation.

1. Interviews

The following persons were interviewed:

- Dr. Manuel Alvárez, Director Department of Research
- Dr. Luis Romano, Director of Planning
- Dr. Jorge Ardila, presently a functionary of the Instituto Interamericano de Ciencias Agrícolas, IICA. A person very knowledgeable about ICA and its human resources.

2. Analysis of Documentation

The documents analyzed were the following:

- Ardila, Jorge
  "Estudio del ICA".
  "Evolución histórica del proceso de capacitación en postgrado, 1960-1978", vol. II.
  "Descripción del proceso general de migración del personal capacitado en postgrado, para el período 1960-1978", vol. III.1.
  "Descripción detallada del proceso de migración del personal capacitado en postgrado, para el período 1960-1978", vol. III.2.
  "Studies about ICA carried out for IICA (OAS), May, 1979, Bogotá (unpublished: preliminary version).

- ICA, "Diagnóstico de la Investigación Agropecuaria en Colombia", 3 volumes, (unpublished: working document) Chapter of Human Resources, Bogotá, June 12, 1979.

- ICA, "Plan de Capacitación Profesional en Ciencias Agropecuarias," 1979-1985, Bogotá, May 4, 1979.

II. HUMAN RESOURCES OF ICA

1. Evolution and Professional Levels 1/

In charts II-1, II-2, and II-3, the characteristics of the human resources in ICA, according to its distribution by departments and professional training are presented. From the charts, the following conclusions can be drawn:

a) ICA has been a unique institution in Latin America in that it has counted with a very large quantity of highly trained professional staff: over one thousand people through the years of 1974-1979.

b) However, it had a very significant decrease of 18% of total professionals, during that same period of time (1974-1979).

c) The Research Department dropped from 517 total professionals in 1974 to 321 in 1979. While the number of professionals with B.S. degrees decreased considerably, those with M.S. and Ph.D. degrees went from 77 to 145 and 34 to 39, respectively, during the same years.

d) The participation of the Department of Research in the total number of personnel decreased from 38.4% in 1974 to 29.2% in 1979.

Chart II-4 presents the total number of professionals of the Research Department, distributed by level of training and by profession, for the year of 1978.

2. Existing Human Resources in Relation to Needs

According to the persons interviewed in ICA, it was considered that for the required research in the agricultural sciences the existing human resources are insufficient.

Without taking into account its needs for professionals at the B.S. level, ICA, in its Training Plan 2/ projected its needs for human resources at

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1/ Based on "ICA, Diagnóstico de la Investigación Agropecuaria", 3 volumes, Bogotá, June, 1979.

2/ ICA, "Plan de Capacitación Profesional en Ciencias Agropecuarias, 1979-1985", Bogotá, May, 1979.

the level of M.S. and Ph.D. until 1985. This projection was made taking as a base the total requirements for the decade of the seventies. The needs for specialized personnel in all of ICA amount to 483 persons, of which 100 are to be Ph.D. and 383 are to be M.S. The needs for specialized personnel in the Research Department alone have been estimated as 361, of which 88 are to be Ph.D. and 273 are to be M.S.

For the purposes of the Research Department, it is considered that the personnel at the level of Ph.D. should be trained abroad, while, on the other hand, 87% of the M.S. personnel should be trained within the country.

The persons interviewed considered that the training plan will not be fulfilled in terms of the quantity of people to be trained.

The interviewees considered that the personnel trained for research presently employed by the Research Department, have an adequate training level for the research work taking place.

3. Formal Training

ICA's human resources training, has always been formal; furthermore, this formal training is considered of great importance.

Justified by the Training Plan, it is considered that "the acquisition ... of knowledge cannot always be made by the accumulation of experiences, since this would take too much time and would not always take into account the latest scientific advances of the world. Due to this, ICA has a graduate training program for its staff to enhance in this way, the capacity of the trainee to resolve limiting problems of the national agricultural activities, in an adequate way." 1/

4. Place of Training

In the document of Jorge Ardila 2/, it is pointed out that "the graduate programs for ICA staff abroad are diminishing in their number and importance through time in as much as domestic training programs are

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1/ ICA, Op. cit.

2/ Ardila, Jorge, Estudio del ICA, Vol. II.

increasing. This is as a result of the decrease in the amount of foreign financial resources, together with an increase of study possibilities within the country: an agreement made between ICA and the Universidad Nacional has been active for several years now, for training up to the level of M.S. As a consequence, the training plan states clearly that most of the M.S. studies will be done in Colombia, while Ph.D.'s will be done abroad.

Further on, the evolution of the training of the human resources of ICA, will be detailed in section IV-1.

On the other hand, the staff interviewed considered that the personnel trained abroad was prepared in a way that was adequate for the research needs of the institution. Furthermore, there exists the criteria that, between the termination of post-secondary training (B.S.) and the initiation of a specialization, there should be a time lapse. During this time lapse the individual works in the institution which allows him to accumulate knowledge and experience to define and profit better his later training.

5. Migration of Professionals 1/

Chart II-5 details the personnel with postgraduate degree that remained and that left ICA, by basic profession, for the period of 1960 to 1978. Of a total number of 652 Ph.Ds and M.S., that joined ICA during those years, only 396 were present in the institution in 1978, and 256 have left it.

6. Main Causes of Migration

According to the interview with Jorge Ardila, the main causes of migration can be grouped in two categories which are: working conditions and policies of the institution with respect to possibility of promotion for the trained personnel.

a) Working conditions

The following working conditions can be mentioned:

i. Lack of infrastructure and facilities for carrying out research.

1/ Based on the document of Jorge Ardila, Op. cit., and ICA, "Diagnóstico de la Investigación Agropecuaria en Colombia".

CHART II - 1

PROFESSIONAL PERSONNEL BY LEVELS OF EDUCATION - 1974, 1976, 1979

DEPARTMENT	Bachelor's Degree			M. S.			Ph. D.			T O T A L		
	1974	1976	1979	1974	1976	1979	1974	1976	1979	1974	1976	1979
Research	406	205	137	77	155	145	34	32	39	517	392	321
Rural Development	256	190	149	22	76	88	1	7	6	279	273	243
Livestock Production	279	220	120	14	23	26	2	4	2	295	247	148
Agricultural Products	120	95	42	8	26	24	2	3	2	130	124	68
Transfer of Technology	-	-	222	-	-	17	-	-	-	-	-	239
Administration and Planning	106	64	59	17	23	20	2	5	2	125	92	81
TOTAL	1.167	774	729	138	303	320	41	51	51	1.346	1.128	1.100

CHART II - 2

PERCENTAGE DISTRIBUTION OF PROFESSIONAL PERSONNEL BY TRAINING AND ACTIVITIES - 1974, 1976 AND 1979

DEPARTMENT	1974				1976				1979			
	B.S.	M.S.	Ph.D	Total	B.S	M.S.	Ph.D	Total	B.S.	M.S.	Ph.D	Total
Research	78.5	14.9	6.6	100.0	52.3	39.5	8.2	100.0	42.7	45.2	12.1	100.0
Rural Development	91.8	7.9	0.4	100.0	69.6	27.8	2.6	100.0	61.3	36.2	2.5	100.0
Livestock Production	94.6	4.7	0.7	100.0	89.1	9.3	1.6	100.0	81.0	17.6	1.4	100.0
Agricultural Products	92.3	6.2	1.5	100.0	76.6	21.0	2.4	100.0	61.8	35.3	2.9	100.0
Transfer of Technology	-	-	-	-	-	-	-	-	92.9	7.1	-	100.0
Administration and Planning	84.8	13.6	1.6	100.0	69.6	25.0	5.4	100.0	72.8	24.7	2.5	100.0
TOTAL	86.7	10.3	3.0	100.0	68.6	26.9	4.5	100.0	66.3	29.1	4.6	100.0

CHART II - 3

PERCENTAGE DISTRIBUTION OF PROFESSIONAL PERSONNEL, BY ACTIVITIES AND TRAINING - 1974, 1976 AND 1979

DEPARTMENT	B. S. LEVEL			M. S.			Ph. D.			T O T A L		
	1974	1976	1979	1974	1976	1979	1974	1976	1979	1974	1976	1979
Research	34.8	26.5	18.8	55.8	51.2	45.3	82.9	62.7	76.5	38.4	34.8	29.2
Rural Development	21.9	24.5	20.4	15.9	25.1	27.5	2.4	13.7	11.8	20.7	24.2	22.1
Livestock Production	23.9	28.4	16.5	10.1	7.6	8.1	4.9	7.8	3.9	21.9	21.9	13.5
Agricultural Products	10.3	12.3	5.8	0.1	8.6	7.5	4.9	5.9	3.9	9.7	11.0	6.2
Transfer of Technology	-	-	30.5	-	-	5.3	-	-	-	-	-	21.7
Administration and Planning	9.1	8.3	8.1	12.3	7.6	6.3	4.9	9.8	3.9	9.3	8.2	7.4
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

CHART II-4

RESEARCH DEPARTMENT. DISTRIBUTION OF PROFESSIONALS BY LEVEL OF TRAINING AND FIELD OF WORK, 1978

Degree	Animal Sciences	Agro-nomy	Veterinary Sciences	Agric. Engineer	Bio-metry	Director Expe. Cen.	Regional Inv. Dir.	Admini-stration	TOTAL
Ph.D	7	17	7	1	1	1	-	1	35
M.S.	22	67	16	8	3	9	7	-	131
Veterinarian	12	-	14	-	-	3	-	-	29
Zootechnician	7	-	-	-	-	-	-	-	7
Agronomy Engineer	7	88	-	7	1	6	-	-	109
Agricultural Engineer	-	-	-	2	-	-	-	-	2
Chemist	-	2	2	-	-	-	-	-	4
Biologist	1	2	-	-	-	-	-	-	3
Microbiologist	-	-	2	-	-	-	-	-	2
Bacteriologist	-	1	6	-	-	-	-	-	7
Ecologist	1	-	-	-	-	-	-	-	1
System Engineer	-	-	-	-	1	-	-	-	1
Statistician	-	-	-	-	2	-	-	-	2
Economist	-	-	-	-	1	-	-	-	1
TOTAL	57	177	47	18	8	19	7	1	334

CHART II-5

BASIC PROFESSIONS OF PRESENT AND RETIRED PERSONNEL WITH GRADUATE DEGREE
PERIOD OF 1960-1978

Basic Profession	Number of Professionals				Total	Retired / Present
	Present	%	Retired	%		
1. Agronomy Engineer and/or Agricultural Engineer	229	57.82	142	55.46	371	62.0
2. Veterinarian and/or Zoo-technician	125	31.56	61	23.82	186	48.8
3. Economist	5	1.26	11	4.30	16	220.0
4. Agricultural Economist	2	0.51	12	4.69	14	600.0
5. Sociologist	7	1.76	4	1.56	11	57.1
6. Industrial Engineer	1	0.25	-	-	1	0.0
7. Public Administrator	6	1.54	-	-	6	0.0
8. Business Administrator	3	0.76	6	2.34	9	200.0
9. Forestry Engineer	1	0.25	1	0.39	2	100.0
10. Ecologist	1	0.25	-	-	1	0.0
11. Chemist	2	0.51	4	1.56	6	200.0
12. Architect	1	0.25	1	0.39	2	100.0
13. Psychologist	1	0.25	-	-	1	0.0
14. Chemical Engineer	1	0.25	-	-	1	0.0
15. Lawyer	1	0.25	-	-	1	0.0

Basic Profession	Number of Professionals				Total	Retired / Present
	Present	%	Retired	%		
16. Home Economist	1	0.25	3	1.17	4	300.0
17. Civil Engineer	3	0.76	2	0.79	5	66.6
18. Mechanical Engineer	2	0.51	-	-	2	0.0
19. Biologist	1	0.25	1	0.39	2	100.0
20. Microbiologist	1	0.25	1	0.39	2	100.0
21. Bacteriologist	2	0.51	2	0.79	4	100.0
22. Publicist	-	-	1	0.39	1	-
23. Librarian	-	-	1	0.39	1	-
24. Biochemist	-	-	1	0.39	1	-
25. Communicator	-	-	2	0.79	2	-
TOTALS	396	100.00	256	100.00	652	64.6

ii. Difficulties created by the internal organization.

iii. Other responsibilities (extension, rural development, control, supervision) are added to the researchers, different to research, which absorb great deal of their time.

b) Institutional policies

This category is basically related to the lack of stimuli different from salary (due to ICA's own limitations) to encourage the development of research capacity. This category includes the partial or total lack of possibilities for attending seminars and conferences, especially those abroad; travel opportunities and a sabbatical year.

In addition to the above, but not as a cause (but rather an effect), are the problems of salary and competition with other employment sources.

7. Migration Within the Institution to Other Activities Different from Research

According to those interviewed, the great majority of personnel involved in research remain in this area of work, since new functionaries are generally brought in for administrative posts.

However, the problem of the sub-utilization of specialized personnel, is present and recognized as another of the principal causes of migration from the institution.

8. Foreign Human Resources

ICA, in its period of formation, relied heavily on foreign human resources for research, partially due to its linkage with foreign institutions. Presently, there are no foreign human resources in ICA. It relies totally on national personnel.

III. OBSTACLES AND LIMITATIONS TO RESEARCH

According to the persons interviewed, the following can be included among the limitations and obstacles to research: insufficient number of trained human resources; lack of contact and knowledge of research activities being carried out at the world level; lack of stimuli, as well as the general pro-

blems caused by migration; and the lack of financial resources.

The last cause is one of the most important. It is noted 1/ that "In relation to research, the tendency is toward cost reduction; from a growth index of 100 in 1962, an index of 83.2% was reached in 1978, with an annual average growth rate of -2.1%. The total participation in costs went from 41.1% in 1970 to 27.7% in 1978".

IV. ICA'S PROGRAM OF TRAINING

1. History

Based on the study of Jorge Ardila 2/, the number of technical staff that began studies at the M.S. and Ph.D. levels in agricultural research during the period from 1960 to 1978 is presented in Charts IV-1 and IV-2. This information is classified according to the following categories: studies abroad financed by international agencies or by the ICA-ICETEX (Instituto Colombiano de Estudios Técnicos en el Exterior) funds, study within the country, preferably in the Graduate Study Program (PEG) under the auspices of ICA-Universidad Nacional. In this last category the few technical staff that studied in Colombia in programs different to that of PEG are included. A total of 342 persons joined the graduate training program of ICA. Out of them, 73 as Ph.D. candidates and 269 as M.S. candidates. All Ph.D. candidates were to be trained abroad, and of the 275 M.S. candidates, 143 were to be trained in the country and 106 abroad. The proportion of the training for M.S. degrees in Colombia increased significantly from year to year, compared to the training abroad.

Most (95%) of the training for Ph.D., done always abroad, was financed by international institutions. Meanwhile, training at M.S. levels abroad and in Colombia, was only partially financed (39%) by non-Colombian funds.

2. Importance Given to Training

At the conceptual level, as well as to the importance assigned according to those interviewed, training is an important activity in the insti-

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1/ ICA, "Diagnóstico de la Investigación Agropecuaria en Colombia".

2/ Ardila, Jorge, "Estudio ICA", Vol. I.

titution. An indication of this is the presentation and approval of the training program already mentioned.

It should be noted that while the foreign Foundations were giving support to ICA, the training program was quite large; however, with, and due to, the weakening of ties with the international Foundations, training has been reduced.

3. Alternatives to Improve the Scientific Capacity of the Researchers

Those interviewed in ICA considered that, once the formal academic training of the human resources dedicated to research is concluded, there are other methods to improve their capacities and to keep them up-dated, likewise: travel for study, participation in both national and international conferences and seminars (with special emphasis on the international ones) and training courses.

V. TRAINING FUNDED BY IDRC

1. Number of Trainees and Specialization

As part of the Rural Development Project (Caqueza Project) of ICA, IDRC supported the training of 5 persons from ICA with the commitment to return to the institution, in the following fields: 2 in soils (1 M.S. and 1 Ph.D.), 2 in education and extension (both Ph.Ds), and 1 in rural physiology (M.S.). All 5 returned to ICA, but 1 left the institution after 4 years of his return.

2. Selection Criteria

The selection criteria used by ICA for the personnel to receive additional training including the one funded by IDRC, are the following:

- Academic work quality in previous studies.
- Functions within the project.
- Professional abilities.

3. Difficulties with Personnel Funded by IDRC

There have been difficulties for the total utilization of the human resources trained in the areas of extension and rural sociology, for two reasons in particular:

- Excess of personnel trained in these areas;
- and mainly, the weakening of research in the socio-economics area within ICA.

4. Recommendations for Relevance of the Training Programs of IDRC

The principal recommendation, without forgetting others such as study trips and, in general, all that was detailed in section IV-3, is that of further support for international exchange of knowledge about scientific advancements and about specific research experiences.

CHART IV-1

M.S. STUDENTS* FROM 1960 TO 1978 IN AGRICULTURAL RESEARCH ACCORDING TO PLACE OF TRAINING AND ORIGIN OF FUNDS

Year	Total Number of Students	Students Trained Abroad					Students Trained in Colombia (PEG) with National Funds	
		%	Funded by					
			International Agencies		ICA-ICETEX			
			No.	%	No.		No.	%
1960	3	100	3	100	-		-	-
1	6	100	6	100	-		-	-
2	10	100	10	100	-		-	-
3	7	100	7	100	-		-	-
4	6	100	4	66.6	2		-	-
5	3	100	3	100	-		-	-
6	12	100	11	91.6	1		-	-
7	12	41.6	5	41.6	-		7	58.3
8	16	56.2	9	56.2	-		7	43.8
9	24	70.8	16	66.6	1		7	29.2
1970	23	56.5	13	56.5	-		10	43.5
1	11	72.7	6	54.5	2		3	27.3
2	46	28.2	8	17.4	5		33	71.7
3	31	25.8	2	6.4	6		23	74.2
4	19	10.5	1	5.3	1		17	89.5
5	26	7.7	1	3.8	1		24	92.3
6	12	8.3	-	0	1		11	91.2
7	1	100	1	100	-		-	-
8	1	0	-	0	-		1	100
Total	269		106		20		143	

* Expressed as number of students that started training that year

CHART IV-2

PH.D STUDENTS* FROM 1960 TO 1978 IN AGRICULTURAL RESEARCH ACCORDING TO PLACE OF TRAINING AND ORIGIN OF FUNDS

Year	Total Number of Students	Students trained abroad funded by		
		International Agencies		ICA-ICETEX
		No.	%	No.
1960	-	-	-	-
1	3	3	100	-
2	5	5	100	-
3	4	4	100	-
4	3	3	100	-
5	3	3	100	-
6	5	4	80	1
7	5	5	100	-
8	7	7	100	-
9	4	4	100	-
1970	5	5	100	-
1	4	4	100	-
2	9	8	89	1
3	6	6	100	-
4	6	5	83	1
5	-	-	100	-
6	1	1	100	-
7	3	2	67	1
8	-	-	-	-
Total	73	69		4

* Expressed as number of students that started training that year.

FUNDACION PARA LA EDUCACION SUPERIOR - FEDESARROLLO

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INSTITUTIONAL INTERVIEW SOCIAL SCIENCES RESEARCH:

FUNDACION PARA LA EDUCACION SUPERIOR - FEDESARROLLO

I. INTRODUCTION

Fedesarrollo can be considered among the most important Colombian institutions in the area of Social Sciences due to the research produced, the high quality thereof, the volume of publications produced and the standard of its researchers.

It should be noted that since IDRC has not awarded funds for training to Fedesarrollo, a large part of the interview designed in the training study does not apply. In order to make the institutional study of this agency, one of the main researchers, who has worked with Fedesarrollo for a long period of time, Dr. Juan José Echavarría, was interviewed.

II. DESCRIPTION OF THE INSTITUTION

Fedesarrollo was created in 1970. "It is a private Foundation, which is both independent and non-profit, and is dedicated to research in the areas of economy, political science, history, sociology, public administration and law. It aims to contribute to the development of policies in social and economic areas; to promote the discussion and understanding of problems of national importance; and to publish and circulate original analyses of national and Latin American economic and sociopolitical phenomena. Through these means, it contributes to improve the quality of higher education. In addition to the publication of the diverse research studies which it carries out, Fedesarrollo, since 1971, has published a quarterly journal Coyuntura Económica." 1/

1/ Synthesis taken from Fedesarrollo, operación desarrollo, 1980

III. CONSIDERATIONS ABOUT ITS HUMAN RESOURCES

1. Human Resources and Professional Level

Researchers are classified by the following criteria:

i. Member researchers: These are the researchers which are permanently employed by the institution.

ii. Associate researchers: These can be hired for research on specific projects.

Recently, the category of Visiting Researcher, whose link with the institution comes through his work on a specific project, has been created. His affiliation lasts until the end of the project on which he is working.

Out of the Member Researchers (total 11), 2 have Ph.D., 3 have M.S., and 6 have professional degrees (B.S.). The Associate Researchers, (9), 6 have Ph.D., 2 have M.S. and 1 has a professional degree (B.S.).

2. Relation Between the Number of Researchers and the Needs for Research

The interviewee considers that Fedesarrollo has enough research personnel. However, the situation varies according to the number of projects underway.

Presently, Fedesarrollo is financed with its own resources, which are obtained through contracts for the execution of research projects.

3. Considerations Related to Formal Training, Place of Training and the Participation of Foreign Researchers

It is considered that formal training, at different levels, gives more benefits to the institution. A correlation exists between more academic training and a better performance.

With respect to the place of training, those who have advanced training have studied abroad. Although the level of the M.S. in the country can be improved, it is considered that graduate work within the country cannot be compared with graduate work done abroad (in countries with a high degree of development), principally because of: a) the available elements or technical tools of social research; b) the graduate schools

abroad, which are updated with relation to the latest developments in the social sciences; and c) the information and documentation facilities.

Initially, foreign personnel was important to the institution, but presently, there is a high number of national personnel, due to their high level of academic preparation. Contact is maintained with important foreign researchers, through attendance at conferences and seminars.

4. Considerations in Relation with Migration of Human Resources

Fedesarrollo presents a peculiarity in relation to the problem of migration of human resources. There is great stability among the researchers and, in the long run, there is no real migration. Short-term migration is temporary and basically due to the flow of personnel that is going to work with government; however the person who leaves, returns. This migration is considered healthy for the institution due to the experience acquired in the government sector. The other type of migration is migration abroad, either for research work or for further training. (It should be noted that the costs of training or of research work is paid by the researcher since Fedesarrollo does not have budget for training programs).

5. Obstacles and Limitations to Research

The principal obstacle to research is that of financial resources: financial pressure is Fedesarrollo's main difficulty. From its foundation until three years ago, the Ford Foundation gave economic support to the institution. Since then, Fedesarrollo has basically been financing itself.

For the contracting of research projects, there has been a movement from national sources to international sources.

In the opinion of the interviewee, the contracting of research projects with national entities is more relevant and important since it reflects more closely the necessities and problems of priority to be investigated for the country.

6. Considerations about the Problem of Quantity Versus Quality of Human Resources for Research

Fedesarrollo considers that, for the country in general, one of the problems to be resolved is that of quantity, linked obviously to the quality of the researcher. However for Fedesarrollo, the need is to keep a group of highly qualified researchers even if it is small; otherwise their survival, based on "selling" good projects, would be at stake.

7. Priorities for Research

Fedesarrollo, per se, does not have priorities for research. It depends upon the type of researches which come from the initiative and interests of the researchers and from the agencies which contract research projects with the institution.

UNIVERSIDAD DEL VALLE

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INSTITUTIONAL INTERVIEW

HEALTH DIVISION - UNIVERSIDAD DEL VALLE

I. INTRODUCTION

The Health Division of the Universidad del Valle plays an important role in the health research conducted in Colombia.

The following people were interviewed as part of the institutional study of the Health Division:

- Dr. Oscar Bolaños - Dean of the Health Division
- Dr. Vicente Piazuelo - Associate Dean of Basic Sciences of the Health Division
- Dr. Alvaro Dueñas - Chairman of the Research Committee, Health Division
- Dr. Jaime Rodriguez - Head of the Department of Social Medicine, Health Division

II. CONSIDERATIONS ON HUMAN RESOURCES WORKING IN RESEARCH

1. Human Resources and Level of Education

Table II-1 shows the number of researchers in the Health Division and their levels of education. 1/

1/ Information taken from Colciencias Inventory and confirmed by the Health Division of the Universidad del Valle.

TABLE II-1

NUMBER OF PEOPLE AND THEIR EDUCATIONAL LEVEL, 1978

PROFESSIONAL TRAINING	No. OF RESEARCHERS
University graduates	31
Specialists*	26
Ms	35
PhD.	19
TOTAL	111

2. Features of Human Resources Involved in Research

Since the Health Division is part of a university, teaching tends to take precedence over research; however, this does not mean that research is not given priority because it is, in fact, considered important. The university has three functions and objectives: teaching, research and the provision of services. At present, there is a general tendency for all of the human resources in the Health Division to teach; consequently, no one in the Division devotes his time exclusively to research. It is clear then that the Division's human resources fulfill two (minimum) of the three university objectives mentioned above.

3. The Relation between the Number of Researchers and Research Needs.

There are not enough human resources working in research. Current human resources have received adequate training. In the fifties, when the

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* Refers to staff that has taken specialization (post-graduate) courses that do not lead to Masters or PhD degrees.

medical school began, much emphasis was placed on developing the basic sciences through research programs, and many top professionals joined the basic science department of the Health Division (a PhD degree in any of the basic sciences was required to enter the Division). This situation remained the same for about 15-20 years. However, as a result of the large number of applicants and the enormous growth of the student body that has taken place in public universities, the number of entering students has doubled and even tripled. This situation has become more pronounced since 1974. This has meant that both human and financial resources have had to deal with this demand, thereby diverting resources from research to teaching activities. The overall result has had a negative effect on research. 1/

The Health Division of the Universidad del Valle is composed of five schools: medicine, nursing, dentistry, physiotherapy, and clinical laboratory. The schools of dentistry, physiotherapy and clinical laboratory were opened more recently than the schools of medicine and nursing. The basic preparatory subjects taught in all of these schools are given by the same teaching staff which, instead of only teaching in two schools —medicine and nursing— as they did before, must now teach in five schools. Thus, these basic preparatory courses have become a high priority, requiring twice the amount of staff that is presently employed. This is why those interviewed stated that the staff is bogged down with teaching these basic courses, consequently affecting research.

4. Considerations on Formal Training, Where Present Human Resources Are Trained and the Participation of Foreign Human Resources

It is thought that in training human resources the emphasis should be on formal academic education, which is the best way to prepare these resources. Directed research programs should be part of this formal education process. Most of the staff currently working in research received training abroad. To take a PhD, the student must study abroad because there are no doctoral programs at the

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1/ It should be noted that while the increase in the number of students admitted has been high, the increase in human and economic resources and infrastructure has been lower.

university. The situation is different at the Masters level. The Health Division offers post-graduate courses that enable the student to receive a Masters degree in Colombia. It is important to point out that the human resources taking Masters degrees in the basic sciences complete their studies and must go basically to teaching activities because of the lack of research resources.

Initially, foreign human resources significantly influenced the development of the Health Division in a positive way. These resources came to the University as visiting professors. At present, there are no visiting professors in the Health Division. Trained national staff has replaced these foreign resources. It is also true that several of the visiting professors who initially joined the Division have stayed on and could be considered part of it since they have been there for 10-18 years.

5. Considerations on the Migration of Human Resources

The migration of human resources depends on the area of specialization. The most critical are:

a. Pharmacology. This is the area of greatest flux. The competition in this case comes from the private sector. Once the human resources trained by the university have fulfilled their obligations to it, they migrate to the private sector.

b. Biochemistry. There is much migration in this area as well. In this case the competition comes from private universities. The Health Division has trained 48 Ms in this field, but at present only has 4 Ms.

c. Pathology. There is significant migration to the private sector.

d. Microbiology. In this case, there is more stability. The little competition that does exist comes from the private university.

e. Physiology and Morphology. As a rule, there is no competition in these fields; for this reason, these human resources tend to remain in the Health Division.

The migration of personnel causes problems in terms of both teaching and research. Pharmacology is the most critical area because the personnel migrating in this field is very difficult to replace.

In the other areas of the Division, human resources that had migrated previously are returning to the Division.

III. RESEARCH OBSTACLES AND LIMITATIONS

The two main obstacles limiting research are:

1. Financing

   The scarcity of financial resources constitutes a major obstacle to developing an adequate infrastructure. It is important to note that the present research team considers what exists now, obsolete.

2. Human Resources

   As explained earlier, these resources are in short supply and are under pressure due to the ever-growing teaching load they must assume as a result of the enormous growth of the university.

IV. TRAINING POLICY

Training resources is one of the mainstays of the Health Division. Nevertheless, this training is becoming increasingly limited due to the dearth of financial resources since present sources of financing are minimal.

Every department in the Health Division devises long and short term personnel training plans. Because of the problems outlined here, these plans are determined more by teaching rather than research needs.

As to the methods used to improve the quality of researchers, it was believed that this should be done through research projects. These projects, as stated by those interviewed, must fulfill two conditions:

a. They must be important, top-quality ones;

b. They must:

- be supervised
- be published in international scientific journals and reviews.

This is the only way that the researcher can make himself known and can participate in conferences and seminars held in Colombia and abroad.

INTERVIEW WITH THE PROJECT HEAD

I. INTRODUCTION

The CIMDER project was chosen because of the relation that exists between the Universidad del Valle and the Health Division. For this reason, Dr. Jorge Saravia, project head, was interviewed. Dr. Saravia has headed CIMDER project for six months, after its previous director left.

II. THE IMPORTANCE OF TRAINING IN THE PROJECT

The element of formal education training was not an important part of the project. Only two people have received formal training. One of them did so on his own personal initiative; the other one received this training as part of the project's needs, not in terms of the need to acquire greater knowledge, but rather out of the need to acquire, through formal education, better work methodology tools. Dr. Saravia thinks that formal professional training is more involved with acquiring work instruments and methodology than with the informational nature of the knowledge learned. This is why he feels that the non-formal education and training received by working on the project itself is more important. Likewise, he thinks that most of the CIMDER team has been educated while conducting the research work. Of the two people who received

formal education and training, one of them did so on his own initiative and therefore, chose the university where he studied. The criteria used for the other person's training and education for a Ms degree in public health was decided by the project team; the Universidad del Valle was chosen for this educational training because of the availability of financial resources for this purpose.

Lastly, there was no criticism of the terms and handling of the IDRC grant for the project.

SUMMARY AND RECOMMENDATIONS

1. Even though still quite far from achieving a satisfactory level of research capability, Colombia is at a good starting point of research development. This level is represented by the quality and quantity of its human resources dedicated to research. For 1978, there were 2,414 researchers working on 1,431 research projects, at a cost of Col.$640,720,000 (US$16,324,000) for that year.

   These figures are quite low compared to those of more developed countries, and considering the size, population, resources, and needs of the country.

2. Colombia approved, 1980, a new development plan which includes a national plan and priority programs for science and technology.

3. The defined priority areas and programs of the national plan of science and technology are:

   3.1 Infrastructure Development

      3.1.1 Training of human resources

      3.1.2 Information and difussion of science and technology

      3.1.3 Promotion and support of research and research institutions, seeking to link their activities with the productive sector and the development programs of the country.

      3.1.4 Teaching and research in basic sciences.

   3.2 Applicarion of Science and Technology to Development

      3.2.1 Basic socio-economic needs

         - Food
         - Housing
         - Education
         - Health

      3.2.2 Use and preservation of natural resources

         - Energy
         - Marine sciences
         - Plant resources
         - Ecosysrems

3.2.3 Science and technology related to production

- Industrial technological development
- Agroforestry

With the big exception of basic sciences, it is interesting to point out the fairly close coincidence of the priorities chosen by Colombia with the programs supported by IDRC. Social Sciences are not mentioned in the Colombian program as a separate one. Instead, it appears as a tool in several of them.

The importance given to training and to the formation of human resources is common to both, Colombia and IDRC.

4. Even though there is not a quantified projection of the needs of researchers by areas or programs, the unanimous concensus is that the country is far from meeting that need in all the defined priority areas or programs; even for the more developed sectors such as agriculture and health.

5. Moreover, in addition to the formation and the development of researchers, the problem of absorption and retention of them by the national research agencies is a major one. The brain-drain of Colombia is extremely high. Some of its causes are mentioned in this review paper.

6. Up to now, the initiative of the formation of researchers has been left to the interest of the individual and of the universities. It has depended greatly on the offer of external funding agencies and governments.

   Only now Colciencias and Icetex are creating a fund for the development of researchers abroad and in the country, needed for the priority programs defined by the science and technology plan.

7. There is a consensus that the formation of researchers requires formal training either abroad or in the country. Other activities like "internships", on the job training, study trips, and contacts with more developed research centers, etc., are considered very important, but as a complement to advance and maintain the research capability of already formed investigators.

8. The development of graduate education in the country is considered essential for the formation of investigators in closer correspondence with the conditions and needs of the country research and development problems.

   The graduate education would, in turn, enhance the development of research.

The graduate education present in the country is now very limited and it reaches only the M.S. level and not the desired Ph.D. level.

9. According to LARO's information, IDRC has supported the training of 18 Colombians as part of the Caqueza project (post-project awards included), the CIMDER project, the Lester Pearson program, and the Research Associate award program.

The training of Colombians taking part in the research activity of the project, like in the case of the Caqueza project, or when the training is done through projects supported by PLAMIRH, is not mentioned in this study.

The following chart summarizes the type, place, and purpose of the training obtained by the 18 Colombians just mentioned.

PROGRAM	No.	Type of Training		Place of Training		Purpose of Training		
		Formal	Non-Formal	Colombia	Abroad	Research	Development	Research & Devel.
Caqueza Project (AFNS)	9	3 Ph.D 6 M.S.		2	7	6	1	2
CIMDER Project (HS)	1	1 M.S.			1	1		
STPI Project (SS)	1		1		1			1
L. Pearson Awards (HS, IS)	2		2		2		2	
Research Associate Awards (IS, SS)	5		5		5	2	2	1
TOTAL	18	10	8	2	16	9	5	4

Of the 18 training programs supported, 9 were from AFNS, 5 from SS, 2 from HS, and 2 from IS. All the grantees who have already finished their training abroad have returned to the country, and the rest are expected to return at the end of their training. Ten went through formal training leading to M.S. (7) and Ph.D. (3) degrees.

The main purpose of nine of the programs was to carry out training in the research field, while five were designed to train the person in specific activities of development but not in research itself. Four programs were either a mixture of training in development activities, and in research, or are not known well enough by LARO to be able to better define the program.

The subject areas in which training was given do fall within the ones defined as priority areas by the Colombian national development plan.

10. Important as it is for the country to have 18 additional Colombians with training in research and development activities, the question of how significant this could be to the country, is still valid. A number of 9 to 13 new researchers trained with IDRC support, over a period of about 8 years, is not significant compared to the 2,214 researchers the country had in 1978. However, how valid is it to make these quantitative comparisons knowing what a single investigator could or could not do?

11. Perhaps IDRC might like to review its training policies, as applied to Colombia, as follows:

    a) Continue to support research projects which utilize research itself for training, as in the case of Caqueza, Plamirh, etc.

    b) Revise its policies of supporting research awards for both: a) training with the purpose of capacitating in research or research management, and b) training in development activities of people whose goals are not to participate in research programs.

    c) Continue to support awards for formal training, leading to advanced degrees as well as for non-formal education.

    d) Continue to stimulate, as part of the research projects, the exchange of communication between projects investigators, and their colleagues in other countries and in more advanced research centres. Meetings, short trips, continuous exchange of information, exchange of scientists, can play a very important role to keep the investigators from the less developed countries alive in their field of interest.

e) "Internships" or "post-doctoral" research training could be of great value for junior researchers to become more independent and develop their own research project.

f) Human resources programs could function much closer yet with the program divisions in defining the training areas of interest to the LDCs.

12. Finally, IDRC should look deeper into what it could do to support institutional development and promote graduate education in some of the LDCs, either individually or jointly with other agencies more dedicated to technical assistance.

Some research to understand the migration of talent in relation to institutional development could be supported by IDRC.

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